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dark, while the pigment gradually faded out along the sides of the body where the walls of the latter were continued over the yolk sack, leaving the latter quite light beneath, or of a dirty yellow tint.

The eggs of the common sturgeon are very adhesive and must be transferred to trays formed of wire gauze or thin cotton cloth tacked to wooden frames, as soon after fertilization as possible, and spread out in a single layer. If this is not done the eggs will form large masses through which fresh oxygenated water cannot penetrate, and, as a result, those in the centre of the masses will be asphyxiated, fail to develop and become putrescent. The time occupied in handling them after fertilization should not be over twenty minutes. After two or three hours the eggs are firmly adherent to the wire cloth, thin muslin or cheese cloth, and the trays laden with eggs may be placed in running water without fear of detaching any of them, as their mucigen covering has by this time become quite coagulated and gelatinous, forming a coating over the zona radiata of irregular thickness. The zona proper is quite thin and somewhat elastic, but easily broken, so that the eggs are rather delicate in character. There is no "breathing chamber" developed such as is found in the eggs of many Teleosts. The operator must carefully guard against the appearance of fungus.—*John A. Ryder.*

ARCHÆOLOGY AND ANTHROPOLOGY.

TOPINARD ON THE LATEST STEPS IN THE GENEALOGY OF MAN.¹—In this highly interesting lecture M. Topinard examines the evidence as to the later stages of human phylogeny, including those embraced in the series of placental Mammalia. He examines the opinions of previous writers on the subject, referring principally to Hæckel, Vogt, Huxley, and Cope. He commences by a discussion of the systematic relations of the contents of the order Quadrumana of modern authors, commencing with the lemurs. He concludes that in spite of certain well-known peculiarities, the Lemuridæ must be included in the same order as the monkeys and man, in opposition to the view of Vogt. He then considers the question as to whether the Anthropoid apes should be arranged with the Old World monkeys or with man, the former being the opinion of Cuvier, Huxley, and Vogt; the latter that of Broca

¹ Les dernières Etages de la Genealogie de l'Homme. Leçon de Mars, 1888; Ecole d'Anthropologie, Paris. Extract du Revue d'Anthropologie, May 1888.

(unpublished) and of the writer of the present review.¹ He decides in favor of the former.

The probability of the origin of man directly from Anthropoid apes, as asserted by Hæckel (monophyletic) and Vogt (polyphyletic), or from Lemurs direct (the opinion advanced by Cope) is then discussed, and M. Topinard concludes that neither hypothesis can be maintained, in view of the structure of the posterior foot. He does not think that the ambulatory hind-foot of man could have been derived from the prehensile hind-foot of the other quadrumana, and he therefore traces the origin of *Homo* to a common type in which the prehensile character of that foot has not yet been developed. This is the genus *Phenacodus*, or some allied form of the *Condylarthra*. He combats successfully the opinion that the monkeys and man have been derived from *Ungulates*, in the restricted sense in which that term has been used by some authors who have supported that view. But he adopts the view of Cope, that modern *Ungulates* and *Quadruman*a had a common origin, which is closely allied to the genus *Phenacodus*.

M. Topinard has understood the teaching of the present writer, in quoting him as believing that man was derived directly from Lemuroids without the intervention of the Anthropoid apes. This is to be inferred not only from the observations I have made on the reversion to the tritubercular or lemuroid type to be found in the superior molar teeth of man, but also from the fact that a generalized type of hind-foot is to be looked for in that family. But it was not necessarily the genus *Anaptomorphus* that possessed all the necessary characters, but rather some other members of the same family. M. Topinard has misunderstood me as believing that *Adapidæ* were ancestors of the *Ungulates*. This I have not said. It is perhaps an appropriate place to give a somewhat fuller synopsis of what appears to me to be the state of the evidence on this question. I have already given the outlines of this phylogeny very briefly in the *NATURALIST* for 1885, and the *Origin of Genera* (1887) in an article on the "Evolution of the *Vertebrata*, Progressive and Retrogressive."

In the phylogeny of man from the Protozoon, as given by Hæckel, twenty-one stages were enumerated. Our present information compels us to accept all of these except three, and to insert one prior to the Lemuroids, viz., the *Condylarthra*. From the *Condylarthra* of the family *Phenacodontidæ* to the *Quadruman*a of the family *Adapidæ* the transition is very slight, provided that the latter family is not unguiculate, a point not yet settled. It is also likely that the posterior foot in that family is not prehensile. The opposability of the thumb of the posterior foot is, however, not a character of such importance that it need be much considered in

¹ *American Naturalist*, 1885: "Origin of the Fittest," 1887.

this connection. A very slight modification only of an ambulatory foot would make a prehensile one like that of the Simiidæ, and *vice versa*. In any case, whatever may have been the later stages in the phylogeny of Homo, we can regard such Lemurs as the Adapidæ as in the direct line from the Phenacodontidæ.

There is a remarkable resemblance between man and the Anthropoid apes in some parts of their skeleton in which they differ from the monkeys (Cercopithecidæ, Cebidæ, Hapalidæ, and Lemuridæ). These characters seem to have been neglected by taxonomic writers. In the first place, the Anthropomorpha (Hominidæ and Simiidæ) agree in wanting anapophyses of the vertebræ, while the families of monkeys and lemurs, above mentioned, agree with the Carnivora in possessing them. This gives a distinctly different character to the vertebral articulations in the two divisions. In the Anthropomorpha the intertrochlear crest of the humerus is present, while in the other group it is wanting. The same division has the bones of the one carpal series alternating with those of the other, while in the true monkeys these bones are generally opposite. In the one group the os centrale is rarely present; in the other it is always present. On these grounds I proposed to adopt the Anthropomorpha as a division (sub-order) of the order Taxeopoda, of equal value with the Hyracoidea, Condylarthra, Daubentonioidea, and Quadrumana. The form of the terminal phalanges in all of these groups show clearly that the Taxeopoda must be referred to the Ungulata in the large sense in which it was used by Lamarck and his contemporaries when the term was first introduced. In the system as I have adopted it, the Ungulata are those placental Mammalia which are not mutilate, unguiculate, or edentate, or those whose terminal phalanges are flattened in adaptation to support only, and not for prehension. In this view the marmosets (Hapalidæ) constitute an anomaly, perhaps not to be included in the order, since they are truly unguiculate. The Hyracidæ, on the other hand, show their close affinity with the Quadrumana, not only in their osteology, but also in the structure of their horny nails, which are (except those of the second digits) those of monkeys. These considerations then give the following system of the Taxeopoda:—

Sub-order I. *Hyracoidea*: family Hyracidæ.

“ II. *Condylarthra*: families; Peripitychidæ, Phenacodontidæ, Meniscotheriidæ.

“ III. *Daubentonioidea*: Chiromydæ; Mixodectidæ.

“ IV. *Quadrumana*: Adapidæ; Anaptomorphidæ; Tarsiidæ; Lemuridæ; Cebidæ; Cercocebidæ.

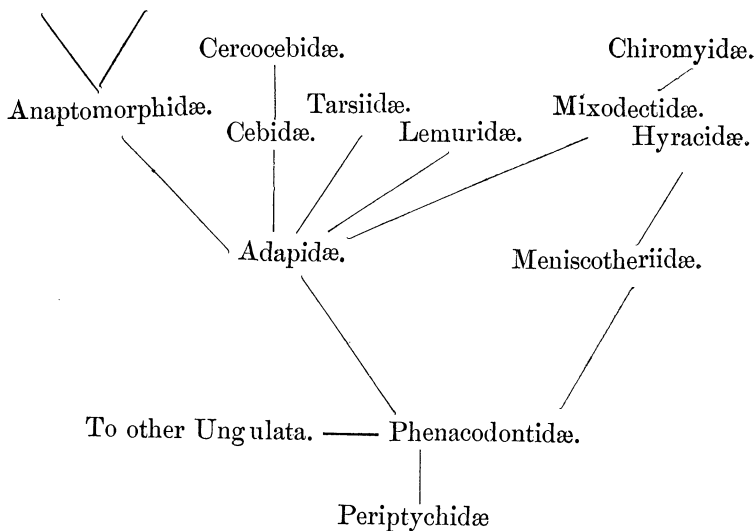
“ V. *Anthropomorpha*; Simiidæ; Hominidæ.

In the Daubentonioidea (Gill) the incisors grow from persistent pulps. In the Chiromydæ the crowns of the molars are simple,

and there are no canines ; in the Mixodectidæ the crowns of the lower molars are quincetubercular, and canines are probably present. In the Quadrumana, Schlosser has shown that in the Lemuridæ the inferior canine teeth are decurved and similar to the incisors, the teeth functioning as such, being the first pre-molars. In the other families of Quadrumana true canines are present in the lower jaw.

From the foregoing considerations the phylogeny of these families will be as follows :—

Hominidæ. Simiidæ.



It may be remarked that the canine teeth in the Adapidæ are of very various development, being incisiform in *Adapis*, small and conic in *Tomitherium*, and large in *Notharctus*. In *Anaptomorphidæ* the canines and incisors are erect, and not decurved as in *Lemuridæ*.—*E. D. Cope*.